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THE WATER SUPPLY SYSTEM OF CAMP McCLELLAN, ALABAMA[1]

By Maurice R. Scharff[2]

The water supply system of Camp McClellan, Alabama, described in this paper, is the system designed and installed for the originally authorized national guard camp for one division, constructed during August, September and October, 1917, during which period the author served as engineer in charge for Morris Knowles, Inc., supervising engineers. Subsequently, after the author was called to active service with the Corps of Engineers in France, extensions and additions were made to the distribution system; and at the time of the signing of the armistice, a project for a new impounded supply and the reconstruction of a considerable part of the system, to take care of a proposed enlargement of the camp, was under consideration. But, in general, no extensive changes were made in the supply works or distributing reservoir, so that substantially the works described herein have continued to serve the camp up to the present time.

The basic requirements for the water supply of the camp were largely fixed by the instructions to the Constructing Quartermasters issued by the Engineering Division of the Department of Cantonment Construction at Washington. This included the specification that the system should be capable of delivering an average of 30 gallons per capita on any one day and a maximum for one hour of 2.85 times the average. It was, of course, expected that the quality of the supply should be unobjectionable.

The original instructions covered the construction of a camp to contain about 34,000 men, which at 30 gallons per capita, would require an average daily supply of 1,020,000 gallons per day. It was not clear whether the instructions contemplated that this should be the average or the maximum daily consumption to be provided for; or, if for the average, what allowance should be made for seasonal and weekly variation in daily draft. It was believed, however, that there would be a substantial variation in daily draft, and it was finally concluded that the safest plan would be to take the prescribed per capita allowance as an average and make provision in the design for an excess of 50 per cent on the day of maximum draft. The system was, therefore, designed to provide a maximum daily delivery of 1,500,000 gallons.

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The rapid study of the situation made upon the author's arrival on the ground on June 16, 1917, led to the conclusion that the only source from which a sufficient supply could be obtained within the time limit fixed by military necessity was the system of the Alabama Water Company, which supplied the City of Anniston.

This system takes its supply from Coldwater Springs, located about seven miles southwest of Anniston. It is one of the great limestone springs of the lower Appalachians, with a minimum flow of about 25,000,000 gallons per day. The pumping station, at the beginning of the construction of the camp, contained two old Holly steam pumps, each of 3,000,000 gallons per day capacity (one of which was removed and sold for scrap in August, 1917, while the other was held in reserve as a spare); and a 10-inch Worthington turbine pump, direct connected to an electric motor and designed to deliver 3,000,000 gallons per day against a pressure of 165 pounds per square inch.

The pumping station delivered water through a 20-inch cast iron main to a 7,000,000-gallon distributing reservoir, from which a 16-inch main supplied the distribution system. A 10-inch main of the distribution system supplied an industrial plant and a small village at Blue Mountain, and on this main, the nearest to the camp site, it was determined to make the connection for the camp supply, reinforcing the distribution system sufficiently to deliver the required quantity to this point.

The new construction included the installation of three belt-connected, electric-motor-driven centrifugal pumps in the Coldwater pumping station of the water company, a Buffalo pump designed to deliver 1050 gallons per minute against 430 feet head, an Alberger pump designed to deliver 1035 gallons per minute against 430 feet head, and a Hill pump designed to deliver 1750 gallons per minute against 430 feet head; the construction of a 10-inch reinforcing main

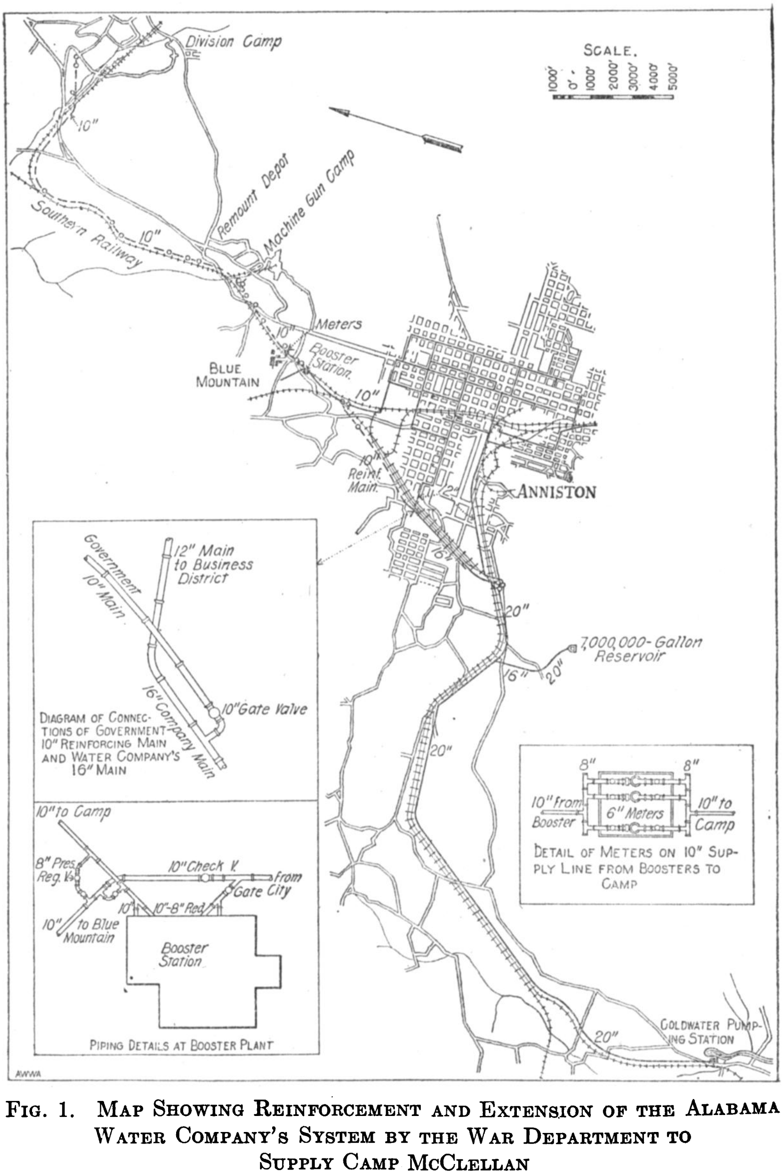

FIG. 1. MAP SHOWING REINFORCEMENT AND EXTENSION OF THE ALABAMA WATER COMPANY'S SYSTEM BY THE WAR DEPARTMENT TO SUPPLY CAMP MCCLELLAN

6500 feet long, tapped into the water company's 16-inch main under pressure by means of a Smith tapping machine; the installation of a booster pumping station including three pumps, two of them (one a Hill, the other an Alberger) designed to deliver 500 gallons per minute each against 225 feet head and direct-connected to electric motors and a Buffalo pump, originally designed to operate at 1500 revolutions per minute and to deliver 1050 gallons per minute against 430 feet head, but belt-connected to an electric motor so as to operate at 1040 revolutions per minute and to discharge about 1000 gallons per minute against 225 feet head; the construction of a 10-inch cast iron force main 25,500 feet long; a distribution system for the divisional camp, the base hospital and the remount depot, containing 5790 feet of 10-inch pipe, 8870 feet of 8-inch, 61,960 feet of 6-inch, 2560 feet of 4-inch, 5080 feet of 3-inch, and 98,975 feet of smaller service lines; and a distributing reservoir, of 800,000 gallons capacity, originally designed to be lined with concrete, but constructed without lining on account of the unusually impervious character of the material in which it was excavated.

The conditions under which this work was done illustrate very well the controlling influence exercised by the time element in the cantonment construction work, and the extent to which designs and construction methods were controlled by considerations other than those which would apply in ordinary practice. The choice of the source of supply, for example, was absolutely limited by the time element. For, while later studies for the enlargement of the camp went into the possibilities of spring supplies, deep well supplies and impounded surface supplies, all of these had to be ruled out from the first consideration because of the obvious impossibility of assuring a supply from these sources prior to the arrival of the first troops.

The designs of the reinforcing and force mains were similarly affected. The water company's distributing reservoir was located at such an elevation as to give a static head at the camp site of over 50 pounds per square inch. The largest size of pipe which there was any possibility of obtaining within the requisite time, however, was 10 inches in diameter, and this size was selected on the basis of possible deliveries, without regard for the fact that theoretical computations appeared to indicate that a larger size might have been more economical. With this size of pipe, it was estimated that, at the assumed maximum daily rate of draft, 1,500,000 gallons per day, a pressure of not less than 30 pounds per square inch could be maintained at the site selected for the location of a booster station, which would be sufficient to maintain domestic service to the sections of the city and suburbs dependent upon this portion of the distribution system; and that by raising the pressure at the booster station to 130 pounds per square inch this quantity could be delivered to the camp with a resultant pressure at the camp site of 50 pounds per square inch.

Another feature of the Camp McClellan water works system which was controlled entirely by the time limit set for completion was the location of the 10-inch supply main, which followed, for the greater portion of its length, the existing tracks of the Southern Railway and the connecting line constructed for the service of the divisional camp. A location approximately 4500 feet shorter would have been available by following some of the existing country roads, but as these roads were practically impassable for heavy traffic, it would have been impossible to complete the delivery of the pipe within the time limit fixed by military necessity.

The necessity for giving the time element this controlling influence is clearly explained by the early history of the water supply construction. When the author arrived upon the ground on July 16, the site was not yet selected, although arrangements had been completed by the local Chamber of Commerce for the purchase of a large tract of property which offered a number of possible locations for a divisional camp. Within the ensuing two weeks the site was selected, the general plan of the camp outlined, railroad connections arranged for and construction upon the first unit started by the contractor. During the same time, the decision was reached to secure a water supply by connection to the mains of the water company supplying Anniston, by the construction of a booster station and reinforcing and supply mains 32,000 feet in length. About August 1, word was received that water must be made available in the camp for troops who would commence to arrive on August 15. Delivery and distribution of the pipe commenced the same day; pipe laying started on August 4; and although two days of rain intervened upon which no pipe was laid, the line was tied in and an ample supply of water for the first troops delivered to the camp by August 15.

The rapid delivery of the pipe required for the 32,000 feet of reinforcing and supply mains and their completion and connection

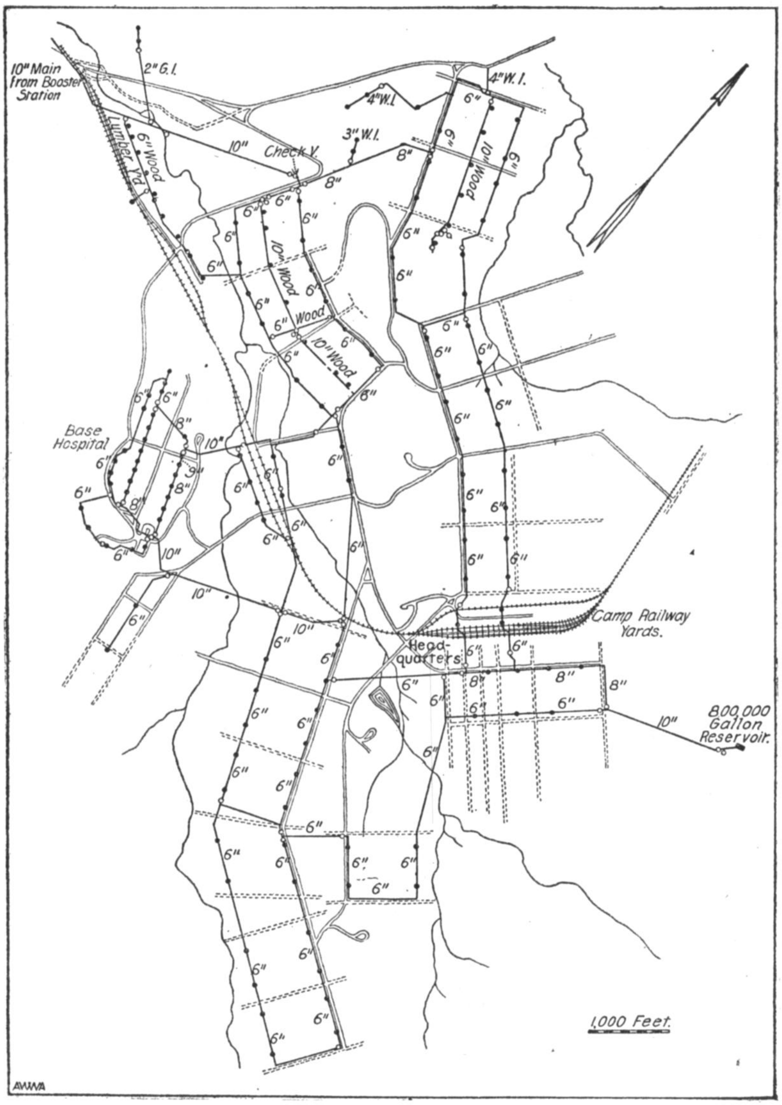

FIG. 2. THE DISTRIBUTION SYSTEM FOR SUPPLYING WATER IN CAMP MCCLELLAN

within ten working days must be ascribed largely to the authorization by the Washington office of the use of cast iron pipe and to the coöperation of the superintendent of the Anniston Foundry of the United States Cast Iron Pipe & Foundry Company. This company furnished from its Anniston, Chattanooga and Bessemer foundries all of the pipe in the line, except about 5000 feet of Universal pipe, and when completed the line contained, in addition to the Universal pipe, standard bell and spigot pipe of Classes A, B, C and D; standard gas pipe of two weights; and several thousand feet of 9.8-inch (25-centimeter) pipe of special quality which had been cast for the Argentine Republic. Not only did the foundry superintendent devote a large part of his time to securing these deliveries, but, in addition, he arranged for the use of the foundry pipe crane, much of the time under his personal supervision, for distributing over 20,000 feet of pipe along the trench from the railroad, with maximum rapidity and a minimum of breakage.

The service of the Anniston Foundry was also of the greatest value in securing rapid delivery of special castings, and even of flanged castings. On one occasion, while additional pumps were being installed in the Coldwater pumping station of the water company, a crack was discovered on a Sunday afternoon in a 16 by 10-inch reducer. The superintendent of the foundry was reached on the telephone and on Monday morning the completed casting, faced and drilled and still hot from the molds, was delivered at the pumping station over 8 miles of country road. This service permitted the casting to be placed in position and pressure restored by 4 o'clock Monday afternoon.

The early operations of the Camp McClellan water works system produced interesting examples of the difficulties due to the peculiar character of water consumption in military encampments. The pressure from the city distributing reservoir was sufficient without booster pumping to deliver the quantity necessary for night use and the requirements of the first troops which arrived on August 15; but after the completion of the installation of the first booster pump on August 19, it was necessary to operate the booster pumping station throughout the day, every day, from about 5 o'clock in the morning to 7 or 8 o'clock in the evening. This method of operation was sufficient to permit the continuous maintenance of satisfactory service after the completion of the camp distributing reservoir on October 13; but until that time much difficulty was experienced in maintaining service, due to rapid fluctuations in pressure resulting from the large variations in hourly use. Prior to the completion of the reservoir, it was found impossible to maintain pressure in the higher parts of the camps immediately after the noon mess hour daily, when the mess kits were being cleaned, and for the greater part of Wednesday and Saturday afternoons when there was no drill, and when most of the showers in the camp could be found running either for bathing or washing purposes. These difficulties were especially great during the period August 19 to September 11, when the booster station was pumping into a closed system, not only without storage but without adequate pressure relief. During this period a direct telephone connection was maintained between the booster pumping station and the engineering office at the camp and during certain portions of the day, an observer was stationed at each point watching the pressure gauges, the observer at the camp directing the operation of the suction valve on the pump so as to control the pressure at the camp. Even in spite of this precaution on several occasions sudden pressure jumps occurred, and breaks in the supply main resulted once or twice.

On September 11 a pressure regulating standpipe of 10-inch pipe supported by a wooden scaffolding was constructed and carried up to the elevation of the distributing reservoir, then under construction. At the top of this standpipe an elbow and a 6-inch valve were leaded in, and this overflow at the highest point of the system proved a reasonably effective pressure regulator, although at times some attention to the pressure gauge at the camp and control by regulation of the suction valves at the booster station were necessary.

The reservoir to which reference has been made, was made necessary by the fact that the maximum hourly rate at which the standards of the Cantonment Construction Division required water to be delivered (2.85 times the daily rate) was approximately twice the maximum capacity of the 10-inch pipe line. The reservoir was located on the opposite side of the distribution from the entrance of the force main, and connected by a 10-inch pipe, so that after the reservoir was in service, the maximum demand could be met without serious fluctuations in pressure.

The original plans for the reservoir called for a structure 50 by 100 feet at the bottom, with side slopes 1½ : 1 and a capacity of 500,000 gallons, the bottom and slopes to be concrete lined. After starting excavation it was found that the material was a very hard, stiff clay, practically impervious to water, and it was decided to omit the concrete lining and to change the side slopes from 1½ : 1 to 2 : 1, giving additional capacity. The original intention was that the reservoir should be filled only to the line of the natural surface of the ground, but on account of the excessive width of the filled embankment and the practically impervious nature of the material, it was later found possible to fill the reservoir to a height of 2 or 3 feet above the elevation originally intended. On this basis the capacity of the reservoir may be taken at 800,000 gallons. Wherever rock boulders projected above the finished lines of the reservoir, instructions were given that they should not be removed, in order to prevent the disturbing of the finished slopes. The construction of the reservoir was begun on August 25 and completed October 13.

In some respects there was much similarity between the cantonment water supply work and the work upon which the author was subsequently engaged in the Water Supply Division of the Office of the Director of Construction and Forestry of the American Expeditionary Forces in France. In both cases the time element was of far greater importance than the ordinary considerations controlling engineering design. In one respect, however, the cantonment construction work was very much more satisfactory and enjoyable than that in France. Reference is made to the availability and orderly rapid delivery of material made possible by the efficient coöperation of the Washington office, as compared with the discouraging impossibility of securing materials which resulted from the tonnage shortage during the early days of the history of the American Expeditionary Forces.